



GAMIFICATION OF PUBLICATION METADATA

To Playfully Explore Our Data

FINAL REPORT
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Contents

Summary	2
Introduction.....	2
The Data	2
Choosing a Game Concept to Develop.....	3
Game Development	4
Abstranaut.....	5
Dissemination.....	6
Outcomes	7
Conclusions and further work	7
Participants.....	8
Appendix 1. Game idea generation.....	9

Summary

This report describes a project that aimed to create game concepts and games based on a set of data about research publications. This was done using linked open data, procedural content generation of game content, and iterative game development, with the aim of creating useful games and game concepts.

Introduction

This report describes the work in a project funded by the National Library of Sweden, a project that aimed at exploring possibilities to create a computer game based on publication metadata. The project *Gamification of Publication Metadata : To Playfully Explore Our Data* ran January-December 2014.

The project idea sprung from a meeting between two researchers and two librarians. We share a genuine interest in games, but the former are experts in linked data and computer games, whilst the latter are experts on the publications at hand and their data.

This project can be seen as an activity within the data-games.org¹ project, which uses open data in the creation of computer games. We found an interesting joint task in trying to create fun games based on publication metadata. Or rather, the actual task of creating something “fun” seemed quite hard to achieve based on data about research publications and we wanted to see if it was possible.

During the developmental work phases Anders Hartvig Hartzen and Anders Thelin have been participating in creating functionality and design.

The Data

Since 2009 metadata about Swedish research publications is gathered in the service SwePub². SwePub serves as a search engine for publications made by Swedish researchers. The metadata is harvested from institutional repositories at circa 30 universities.

Some of the contents in SwePub are made available as open access publications, whereas others just contain links and pointers to where the content can be accessed, for free or with a fee. An initial plan was to support only open access-publications in the game, since these are accessible for everyone for free. However, since the amount of publications would be limited to about 20% of the total amount if only using the freely accessible publications³ we decided to use the full data set.

In 2014 two major development projects related to our project took place within the Swedish National Library. Firstly, the national union catalogue as well as SwePub, are undergoing a remake of

¹ <http://data-games.org>

² <http://swepub.kb.se>

³ [http://swepub.kb.se/hitlist?d=swepub&q=%C3%A5r%3a\(2013\)&f=ext&spell=true&hist=true&p=1](http://swepub.kb.se/hitlist?d=swepub&q=%C3%A5r%3a(2013)&f=ext&spell=true&hist=true&p=1) - using 2013 publication year as an example of amounts of open access publications.

the backend to support linked data usage and access. Data will be made accessible via a Creative Commons CC0-license⁴, which opens up for further use and reuse of metadata.

Secondly, an effort to enhance data quality in SwePub, to allow for bibliometrics and publication analyses.

One of the secondary outcomes of using the same data in this project is that data quality problems will be made more visible and can be corrected.

During the spring of 2014 the SwePub data set became available through a SPARQL interface^{5, 6} which opened up for the actual solutions of how to create a game.

Choosing a Game Concept to Develop

As an early activity we organised an idea generation workshop. The workshop took place in February 2014 and we gathered 15 persons (three librarians, two IT-staff, five researchers, and five students). They were invited to cover several competence fields such as game development, computer science, information architecture, research publications and scholarly communication.

The main purpose of the workshop was to generate ideas about possible games to develop. The workshop started with a brief presentation of the concepts of gamification and procedural content generation⁷, followed by information about the data at hand and the project itself. The group was divided into four smaller ones and was handed papers, pens and post-it notes in order to brainstorm about ideas which then was presented at the end of the workshop. Game ideas proposed were mostly based on existing games or game concepts.

Outcomes and documentation of the workshop are found in [Appendix 1. Game idea generation](#).

Among the conceptual ideas presented were:

- **Backpacker:** A classic computer game, where you as player character backpacks around in the world, exploring culture and trying to make a living doing various jobs, which in the research version e.g. could be starting out by sorting articles in different baskets on time and moving up in the academic hierarchy by completing increasingly advanced tasks.
- **Top Trumps:** a card playing game where the cards symbolise researchers with different strengths in different research areas based on their publishing history. On the back of the cards they have special powers giving various bonuses. Special event cards can invoke accusations of plagiarism, slow down progress due to administration etc. Based on different values on e.g. different universities or researchers players can try to trump and win the other players' cards.

⁴ <https://creativecommons.org/publicdomain/zero/1.0/>

⁵ <http://www.w3.org/TR/rdf-sparql-query/>

⁶ <http://hp07.libris.kb.se/ExploreAndQuery/>

⁷ Procedural generation of content in computer games refers to the creation of e.g. game tracks, maps, objects, quests etc. The content is generated algorithmically and seemingly spontaneously rather than manually. The approach allows saving time on the game development and also allows for a diversity in the actual end-user game experience. Cf. Shaker, Noor and Togelius, Julian and Nelson, Mark J., *Procedural Content Generation in Games: A Textbook and an Overview of Current Research*, Springer, 2014.

- **Risk** (see ill. 1). Each area on a map of Swedish universities generates a certain amount of PhD students each game round. These ally with the area where they are generated or an adjacent one, depending on the attractiveness of these areas. Based on the classic tabletop strategy game.
- **Meeting with the Vice-chancellor** (see ill. 2): The rooms on the floor plan symbolise faculties. Players have to maneuver in order to be alone with the vice-chancellor and apply for research funds. The success of the application depends on what combination of cards the player has collected (e.g. “dissertations”, 2005, Medicine).
- **Dropstracts/Abstranaut** (see Ill. 3.): A number of abstracts are extracted from the results of a search query. The object of the game is to connect abstracts to their correct publication title as fast as possible. The player can save interesting titles for later reading. Another variant of the game idea requires the player to drag abstracts to the correct subject matter before the subject matter box is full.
- **Illuminati**: The players represent different universities. The object of the game is to dominate research fields. To claim domination in a field the university can use its power in that particular research area, which is determined by publication history. Specific researchers can be drawn to your university in order to get bonuses in various fields.

After the workshop we decided which game to initially make playable prototypes of. Abstranaut was chosen since we could see it having a pedagogical benefit of allowing e.g. students to train their skills at scanning abstracts, as well as finding interesting information for their studies. It also seemed like an idea that we could realise with the data at hand.

Several of the other games would be interesting to look further into, but as the project proceeded, we have not been able to try out more concepts in practice, within the time frame the project has been running. Another example of a game that especially appealed to us was Illuminati, since it reminded of academic life, with elements of mirroring the competition between universities and research fields in the real world. However, creating a game that originates from a card game and most likely would have to be a multi-user game put Illuminati into the nice-to-do (but possibly hard to achieve) goals.

Other game concepts involving multi-user gaming (“Risk”, “Meeting with the Vice-Chancellor”) also ended up being a bit too hard to achieve.

A third game, which only has been discussed within the project group is about creating a game based on the “Six degrees of separation”-theory, where researchers would be visualised with their connections to other researchers, and game users would then try to find the shortest route between two researchers.

Game Development

In June 2014 we integrated software for querying and accessing live data from SwePub into a project implemented in C#, within the game engine Unity 3D⁸, by involving a fifth project member, Anders

⁸ Unity <https://unity3d.com/> is a “cross-platform game creation system developed by Unity Technologies, including a game engine and integrated development environment (IDE). It is used to develop video games for

Hartzen, with knowledge of the software. We chose to use Unity mainly because of familiarity with the technology in the development team and the ability to deploy to multiple platforms, including web. Unity 3D is a Danish-developed game engine specifically tailored for independent game development, mobile game development and other forms of resource-constrained game development. While offering rendering, simulation and physics capabilities approaching those of AAA game engines such as Unreal, Unity also offers ease of use, a large asset store and deployment on a large range of platforms. For these reasons, it has become of a favourite of small-scale developers in recent years.

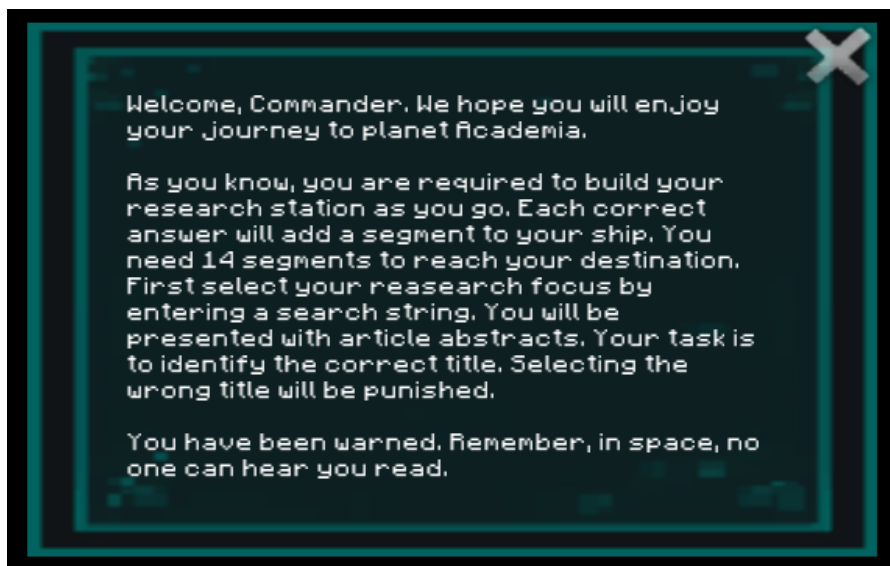
The game prototype was developed iteratively, initially based on feedback mostly from project members. Colleagues at Malmö University Library tested a version of the game in August and students from the idea generation workshop tested another version of it in October. Each of these rounds uncovered usability issues and bugs. Game design and development continued throughout the autumn. At this time, a sixth project member, graphical designer Anders Thelin, contributed with design, logotype, graphics and sounds.

Version 1.0 of Abstronaut was released in December 2014.

Abstronaut

Abstronaut opens to a text explaining the space themed backdrop to the game, as well as brief instructions (see Screenshot 1).

The design and layout of the game is aiming at reminding of computer games from the 90s.



Screenshot 1. Brief introduction text to users in the beginning of the game.

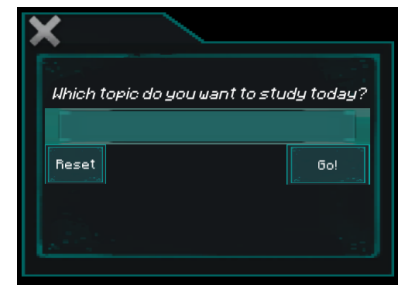
Each round of the game starts with the player selecting a search term (see Screenshot 2), the idea being that something relevant to one's topic of study or research is used.

web sites, desktop platforms, consoles, and mobile devices."

Source: http://en.wikipedia.org/wiki/Unity_%28game_engine%29 (fetched 2015-01-07)

As mentioned above, the objective of Abstranaut is to match abstracts to their publication title as quickly as possible. For each abstract, the correct title is shown along with three titles from other publications.

All of these publication titles are from the set of articles returned from the search query entered by the player. The player progress is represented by modules being added to their research station spaceship: a correct answer adds a module, an incorrect one makes the latest module explode and disappear.



Screenshot 2. Choosing which content of SwePub to play with.

To add time pressure, a counter counts down (starting time adjusted for the length of the abstract), and if it goes low, a crosshair comes up over the player's spaceship. If the counter goes to zero, the ship is blown up and the player starts over from the first level of play.



Screenshot 3. On the top left the abstract is presented. Bottom left the titles which to choose from. On the right side information about level, score and current time left to guess the correct title. The space ship looks more advanced after levelling.

The time pressure is built in to encourage the player to skim and look for keywords, rather than carefully read the text, a skill that we believe that many students need to improve. There are 15 levels of adding modules to the ship before the goal is reached and the round ends.

During game play, all publications whose abstracts were shown are saved in a list that the player can use in their continued research.

Dissemination

- The project was presented at the conference “Länkade data i Sverige” (eng: “Linked data in Sweden”) 2014-03-13. The presentation is available on MEDEA TV, YouTube,

https://www.youtube.com/watch?v=qXaD9-5KmjQ&list=PLjF3DI5gKguuO_hCJLgM9n-nXjrSn1qBk. The project is presented five minutes into the clip.

- Tornbjør, Eva (2014-09-09) "Forskning blir datorspel i nytt projekt", Nyhetsbrevet, Malmö University.

<http://mah.se/Nyheter/Nyheter-2014/Forskning-blir-datorspel-i-nytt-unikt-projekt/>

We are also monitoring international conferences such as "Foundations of Digital Games"⁹ and "10th International Conference on Open Repositories" for disseminating final results in 2015.

Outcomes

- **The project webpage** can be found at <http://mah.se/om-malmo-hogskola/bibliotek-och-it/projekt/att-lekfullt-utforska-var-data> (in Swedish).
- **The game** (v.1.01) can be downloaded (executable file for Windows and Mac) at <https://dl.dropboxusercontent.com/u/709271/Abstronaut%201.01.zip>.
- **Documentation and source** at <https://github.com/andershartzen/SwePubDataGameProject>.

Conclusions and further work

The project shows that using data about research publications in computer games seems feasible and actually becomes quite interesting. However, the nature of the data is very specific to the academic sector, a fact that limits the target audience of some of the game ideas.

We believe it is possible to create more games that help develop the user's information literacy and stimulate information system usage.

Using the code developed in this project it is possible to build other games fetching their content from open data sources with SPARQL interfaces.

A systematic evaluation of the game, to be carried out with students, has been initiated. The setup is that two rounds of the game are played. In between the rounds, the player fills in a questionnaire where they reflect on how they play the game and what tactics they used, as a means to glean some understanding of how they learn from the game. After the two rounds, players answer questions on e.g. the ease of play and enjoyability of play. They also fill in an initial questionnaire with demographic questions and background in reading academic text and playing games. Game play data is collected through log files. A first round of evaluation was carried out with about ten students mid-December. As we have only done initial analysis of the results, and want to carry out a second round of evaluation, we do not report results here.

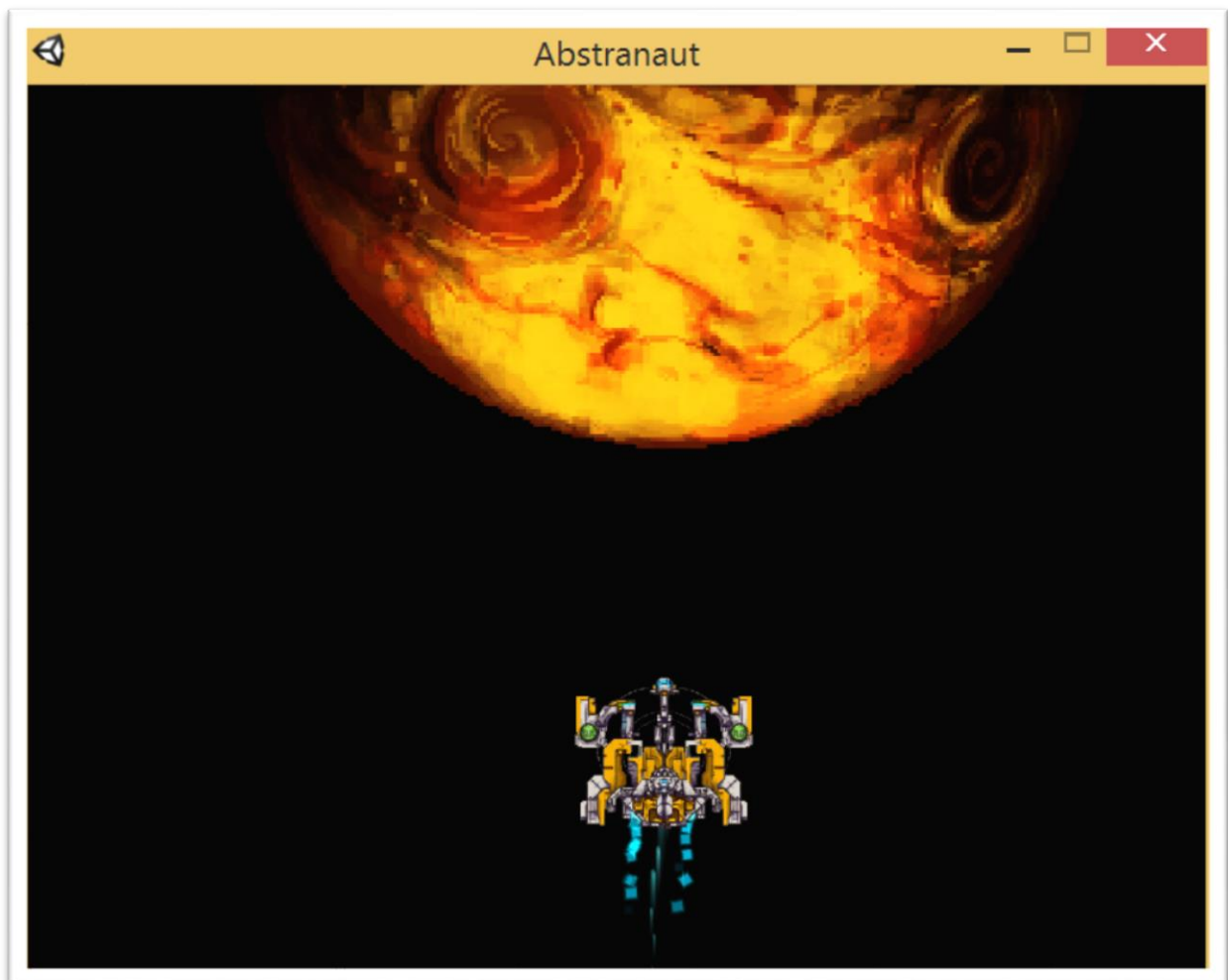
Abstronaut shows the potential of creating data games that can develop skills relevant for the searching and selecting of academic literature, though evaluations remain to show the extent of this. A more advance evaluation setup could examine this effect over time. Something that we have not considered is that different search terms probably vary in difficulty, depending on e.g., if it is used in several domains (which gives titles that are clearly different from the terms used in abstract) and depending on how general it is (again, more probable that titles are more varied). This could be

⁹ <http://www.foundationsofdigitalgames.org/>

something that the player can receive guidance on, in order to begin at an appropriate level. Likewise, the player's background knowledge of a domain will affect the outcome. The Abstranaut game play hides the authors and publication venue, which usually provides relevant information when scanning articles. A more advanced mode of the game could involve matching abstracts to the list of authors – which could also act as an argument in the debate regarding peer review.

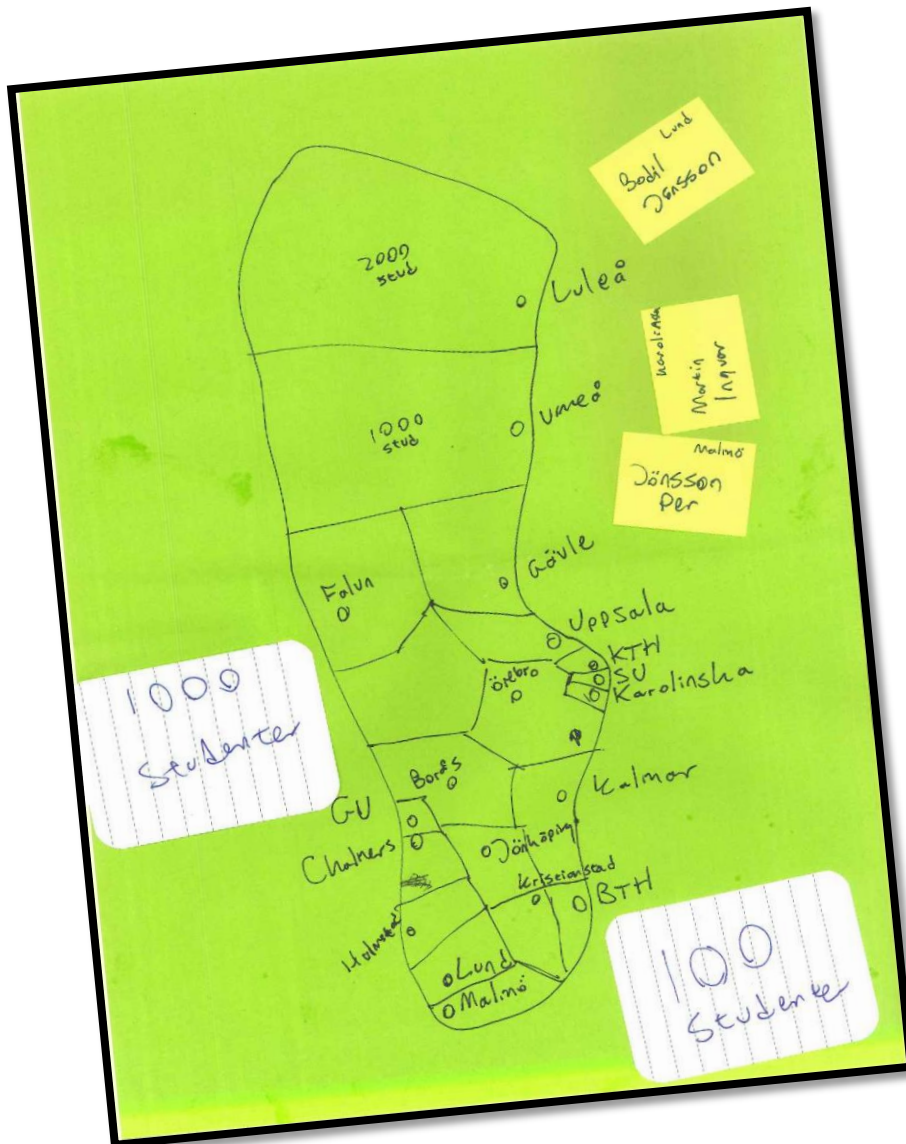
Participants

- Jacob Andersson, Library and IT Services, Malmö University
- Marie Gustafsson Friberger, Good Measure (formerly Faculty of Technology and Society, Malmö University)
- Anders Hartvig Hartzen, IT University Copenhagen
- Jessica Lindholm, Library and IT Services, Malmö University
- Anders Thelin, Frogson Studios
- Julian Togelius, IT University Copenhagen



Screenshot 4. Winning the game

Appendix 1. Game idea generation



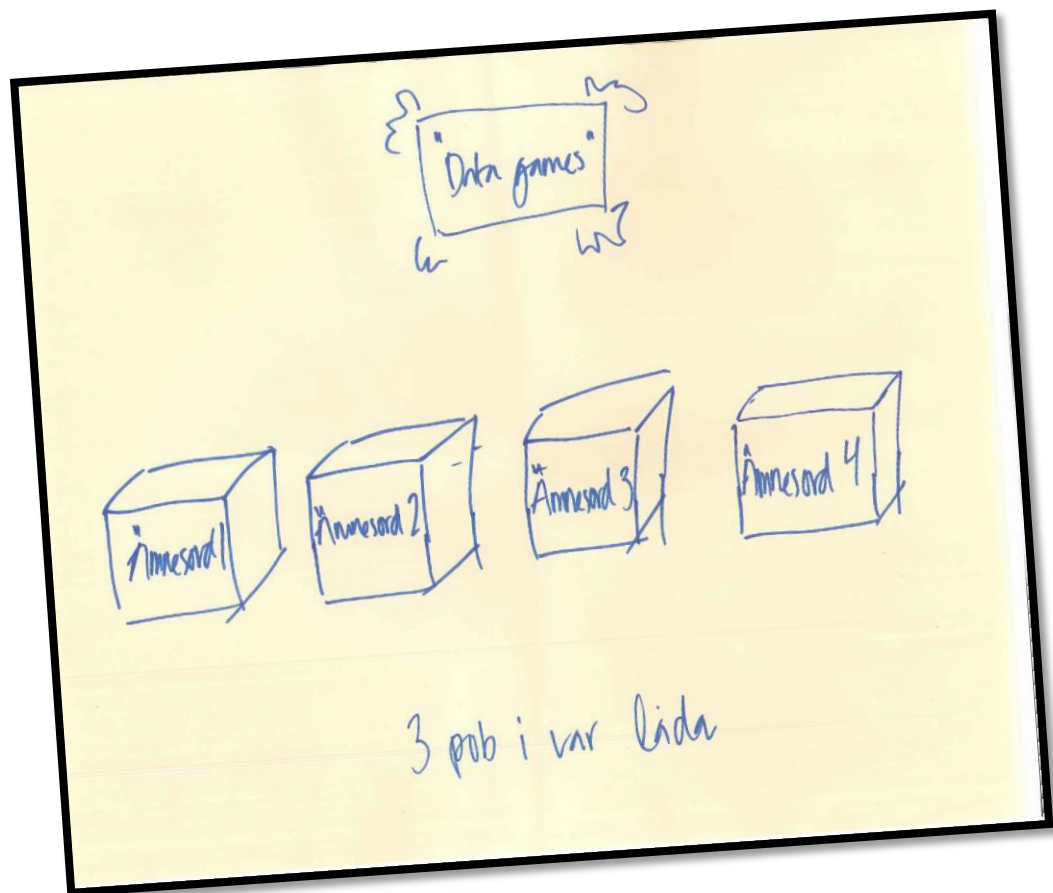
III. 1. Risk.

Each area generates a certain amount of PhD students each game round. These ally with the area where they are generated or an adjacent one, depending on the attractiveness of these areas.



III. 2. Meeting with the Vice-Chancellor.

The rooms on the floorplan symbolises faculties. Players have to maneuver in order to be alone with the principal and apply for research funds. The success of the application depends on what combination of cards the player has collected (e.g. "dissertations", 2005, Medicine).



III. 3. Abstranaut

A number of abstracts are extracted from the results of a search query. The object of the game is to connect abstracts to their correct publication title as fast as possible. The player can save interesting titles for later reading. A variant of the game requires the player to drag abstracts to the correct subject matter before the subject matter box is full.

